

**SUPPLEMENTAL  
Notice of Allowability**

Application No.

10/658,804

Examiner

Gary L. Laxton

Applicant(s)

AHMED ET AL.

Art Unit

2838

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the examiner initiated interview dated 12/30/2008.
2. ☒ The allowed claim(s) is/are 1-3,11-14 and 20-27.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- \* Certified copies not received: \_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_.
- (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application                                |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date ____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br>Paper No./Mail Date ____     | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment                              |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance             |
|  | 9. <input type="checkbox"/> Other ____.  |

/Gary L. Laxton/  
Primary Examiner, Art Unit 2838

1/02/2009

## **SUPPLEMENTAL DETAILED ACTION**

### **EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with John M. Siragusa on 12/30/2008.

Please amended the claims to read as follows:

### **AMENDMENT TO THE CLAIMS:**

1. (CURRENTLY AMENDED) A power module, comprising:

- a module housing;
- a cold plate integrated into the module housing, said cold plate including a direct copper bonded substrate attached to a base plate by a solder layer;
- a DC bus bar including first and second bus bars separated by bus bar insulation that is integrally molded as part of the module housing;
- a set of DC terminals accessible from an exterior of the module housing;
- at least three pairs of AC terminals accessible from the exterior of the module housing; and
- an inverter circuit contained within the module housing, the inverter

circuit configurable to selectively switch between at least three output states and electrically coupled between the set of DC terminals and at least one of the pairs of AC terminals.

2. (ORIGINAL) The power module of claim 1, further comprising a set of control terminals accessible from the exterior of the module housing and electrically coupled to the inverter circuit.

3. (ORIGINAL) The power module of claim 1, wherein the inverter circuit comprises at least three pairs of output nodes each electrically coupled to a respective one of the pairs of AC terminals.

4-10. (CANCELLED)

11. (CURRENTLY AMENDED) A power system, comprising:  
a DC power supply;  
a power module, comprising:  
a housing including an integrated cold plate, wherein the cold plate includes a direct copper bonded substrate attached to a base plate by a solder layer;  
a pair of input terminals accessible from an exterior of the housing, the input terminals electrically coupled to the DC power supply;

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a DC bus electrically coupled to the pair of input terminals, wherein the DC bus includes first and second bus bars separated by insulation that is integrally molded as part of the housing;

three pairs of output terminals accessible from the exterior of the housing;

an AC bus electrically coupled to at least one of the three pairs of output terminals; and

an inverter circuit configurable to selectively operate in one of at least three output states and electrically coupled between the DC bus and the AC bus; and

a controller to generate control signals to control the inverter circuit.

12. (ORIGINAL) The power system of claim 11 wherein the controller is contained within the housing of the power module.

13. (ORIGINAL) The power system of claim 11, further comprising:  
a load, wherein each pair of output terminals is electrically coupled to the AC bus to supply a respective phase of three-phase AC power to the load.

14. (ORIGINAL) The power system of claim 11, further comprising:  
a number of loads, wherein each pair of output terminals is electrically coupled to the AC bus to supply AC power to a respective one of the loads.

15-19. (CANCELLED)

20. (PREVIOUSLY PRESENTED) The power module as recited in claim 1, wherein the direct copper bonded substrate includes a first copper layer, a ceramic layer and a second copper layer fused together.

21. (PREVIOUSLY PRESENTED) The power module as recited in claim 20, wherein the second copper layer is etched to form electrically isolated structures for selectively mounting circuit components.

22. (PREVIOUSLY PRESENTED) The power module as recited in claim 20 wherein the base plate includes a first side to which the solder layer is attached and a second side in thermal contact with a fluid channel for cooling circuit components mounted to the direct copper bonded substrate.

23. (PREVIOUSLY PRESENTED) The power module as recited in claim 11, wherein the direct copper bonded substrate includes a first copper layer, a ceramic layer and a second copper layer fused together.

24. (PREVIOUSLY PRESENTED) The power module as recited in claim 23, wherein the second copper layer is selectively segmented to define a plurality of electrically isolated structures for selectively mounting inverter circuit components.

25. (PREVIOUSLY PRESENTED) The power module as recited in claim 23, wherein the base plate includes a first side to which the solder layer is attached and a second side in thermal contact with a fluid channel for cooling circuit components mounted to the direct copper bonded substrate.

26. (PREVIOUSLY PRESENTED) The power module as recited in claim 1, wherein the DC bus bar is integrally molded as part of the housing.

27. (PREVIOUSLY PRESENTED) The power module as recited in claim 11, wherein the DC bus bar is integrally molded as part of the housing.

***Allowable Subject Matter***

2. Claims 1-3, 11-14 and 20-27 are allowed.

The following is an examiner's statement of reasons for allowance: in order to achieve the goal of providing an architecture for a power module for tri-level inverters that retain a high degree of modularity that allows a base module to be quickly, easily and cost effectively configured as a tri-level inverter, and without requiring complex external wiring schemes. The prior art, then, fails to disclose or suggest, *inter alia*, providing a power module, comprising: a DC bus bar including first and second bus bars separated by bus bar insulation that is integrally molded as part of the module housing.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary L. Laxton whose telephone number is (571) 272-2079. The examiner can normally be reached on Monday thru Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Akm Ullah can be reached on (571) 272-2361. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

1/02/2009

/Gary L. Laxton/  
Primary Examiner  
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